PyroTechnics

THE NOW & THEN NEWSLETTER OF
GENERAL TECHNICS

PERPETRATED LARGELY BY
JEFF DUNTEMANN
& MIKE O'BRIEN

GENERAL TECHNICS

NO. 6 FEBRUARY 1977

CRYSTAL BALL TIME

A struggling writer asked me for help in getting published the first time. She knew nothing of science fiction, but I suggested she read some, study the methods, and try writing it. She laughed and said she wasn't any good at predicting the future.

Most science fiction writers don't look at it that way. Predicting too much too far can make you look pretty silly. (See Nertz & Bolts, this issue). And the future which eventually collides with us is seldom as colorful as the ones we imagine. Personal helicopters for all, Heinlein's Roads, etc., which the forties forsaw for the seventies just haven't materialized. Then again, I still have a 1952 copy of Popular Mechanics containing an article entitled: "We Will Reach the Moon by the Year 2000!"

Well, they weren't really wrong.

I got egg on my face once about ten years ago, when I wrote a story in which engineers of the 26th century carried electronic slide rules around on their belts. These devices were about the size and shape of a slide rule, only they had keys and a digital readout that figured your answer to six places. But God, they were long, and skinny, and flat!

Well, folks, here I go again. Put this issue of PT away somewhere. I will buy one drink for every wrong prediction, for every person who presents this issue to me on the evening of December 31, 1999, wherever I happen to be at that time.

I predict:

That within five years there will be a single chip computer with two hundred instructions, a dozen I/O ports, cassette/video interface, a 20 MHz clock, and 32K of RAM.

That within eight years, this beast will be in 50% of all television sets in this country.

That within twelve years, the computer will shove aside commercial TV as America's favorite personal entertainment next to sex and fast cars.

That within fifteen years the Shuttle will be a success and we will have a permanent orbital research platform greater than one hundred feet across its smallest axis.

That within twenty years, some company will make a profit on some product manufactured in space.

That within twenty-five years, fusion power will be tamed and a fusion generating plant will be under construction.

That some time within the next two hundred years, man will devise a way to travel faster than light.

(You who are re-reading this late in 1999, don't laugh. Sure, I couldn't have foreseen the Hundrucker Effect, which made fusion power feasible in 1981. Yeah, maybe it was silly to expect the American people to pay for a space station. Cripes, whoever would have predicted that there really would be an orgasmitron? Or thought that TV could have competed with it? Yeah, well history is like that. You thought the hyperdrive prediction was funniest of all? Well, turn the tridiac on to the six o'clock news. The Sirians have just landed in Grant Park and presented the Mayor with a hyperdrive as a congratulatory gift for reaching the Third Millenium without destroying ourselves. Crazy universe, ain't it? C'mon, let's go have a beer.)

QUARKS

Steve Johnson's Zilog is now up with 10k RAM and Tiny Basic. So who needs decimal points? Kurt Sakaeda has shelled out for a KIM 1, and now is looking desperately for programs. Well?

I polished off a dandy frequency counter but failed to turn it into a DVM as well. A lousy VCO was my nemesis. Any better designs out there for a 1000-2200 hz linear VCO with 1-1.2v in?

My own computer is wrapping along. More next issue. Sarah Shaw has been hired by Itty Bitty Machine Company as an assembler. I guess she couldn't make it as a compiler. (Sorry, Sarah..)

Hamming in GT has seen a rebirth: WA8WTE has bought a Wilson 2 meter talkie, as has your editor Ed. also laid out 600 bucks for a Kenwood TS520 SSB transceiver, with which he routinely works Central America on 20' of wire strung up in his workshop. What's that 'bout skip, good buddy? Mike O'Brien WB9MJV got the sixer out of mothbals and with the help of Ed. WB9MQY made his first QSO in five years. Sorry about the TV's, folks...

Chuck Ott is looking for a cheap word proccessing system. I wouldn't mind one myself.

Bob Halloran still has lots of GT T-shirt iron-ons. Send him a buck and get something on your chest!

Steve Johnson's cat chewed a hole in Tullio's thermocouple. Seems they were taking the kitty's temperature with an LED bargraph thermometer. Kitty was normal. More than we can say for the thermocouple.

In case you hadn't heard, Lancaster now has a CMOS Cookbook. To be reviewed next issue.

It ain't easy filling ten pages with this sort of thing. Help me out, OK? Keep my mailbox and PyroTechnics from becoming too skinny!

GENERAL TECHNICS is an organization of fannish techies (and not techish fannies, as some wiseass reported) who share data, resources, and experienc in pursuit of a good time and occasional profit. The group meets mainly at cons, hamfests, and private Berserker Weekends.

MEMBERSHIP is terribly difficult to obtain. You must somehow scrape up a number of 13¢ stamps, and then at great effort write a letter explaining what your qualifications as a techie are to

Jeff Duntemann
6424 N. Albany Avenue
Chicago Illinois, 60645

including those stamps. If the above person can read your handwriting you are an

APPRENTICE TECHIE and entitled to call yourself a member of General Technics. You will also receive

PYROTECHNICS until your stamps run out. Renewal of membership is synonymous with sending more stamps. If you decide to quit, we will use one of your stamps to send the rest back to you. If you're nuts enough to want to become a

SECRET MASTER UV TECHNOLOGY (SMUT) you had better talk to

Tullio Proni
1309 Wells Place
Kalamazoo Michigan, 49001

because I don't have anything to do with it.

ANYTHING ELSE, ask me. I may not know but I'll tell you anyway.

FORKS AND DÆMONS

BY MIKE O'BRIEN

I suppose the second column is not too early to get around to explaining the title. We'll try to get to it this time, folks, but we may not make it. Let's see how it goes.

Now, as I dimly recall, we talked last time about how the machine works. This time we'll talk a bit about how it's used effectively. But first, some grim historical details. It used to be the case that in order to run a program on a computer, you had to stand in line in front of the machine, card deck in hand, and run the whole operation yourself when your turn came. That is, you punched the buttons and flipped the switches, and the first card in your deck had machine instructions on it that told the machine how to read more cards (it was wired to know how to read the first card), and eventually your deck got read in. If your deck was in, say, FORTRAN (which was unlikely...FORTRAN was too new then), then the program that translated FORTRAN statements into "machine language" (i.e. binary instructions) had to be right in there in front of your deck. One program ran at a time, all the way to completion, and it had complete control of the machine. After all, why shouldn't it? There was nothing around that it could damage. There were no disk drives around with other people's information on them; there were no disk drives, period.

Even so, when the lines got to be a mile long, there were those who pointed out that while Joe Blow's job was in there crunching (i.e. just computing), the printer was idle, and while the printer was grinding, the CPU was idle. And all those people lined up behind Joe Blow, and being paid by the hour, were also idle. It was not long before someone began to wonder if it might not be possible to somehow have the machine do two things at once, that is, crunch on one job while another one was printing. Printing takes very little CPU time, compared with the time the printer spends actually putting out characters. Of course, there had to be yet a third program in there, to arbitrate between the other two. Thus, the first operating system was born.

It wasn't much.

The first such systems were just simple arbitration packages to allow several (perhaps only two) programs to run at the same time. They would switch control back and forth depending on who actually wanted to do some crunching, and who just wanted to do input or output (I/O).

Of course, other things were going on too. Cards are dreadfully slow, especially for large amounts of data. At that time cards were about it, aside from magnetic tape, which while it holds more data per unit volume tends to be even slower than cards, unless you want to read it sequentially. I heard of one language translater that required no fewer than 27 passes across magnetic tapes to compile statements in its language into machine instructions. I think that must compare with the Chinese Water Torture. To alleviate this mess, fast "random-access" devices were invented; the best known one is the disk drive. This looks like a stack of 33rpm records with no grooves, light brown in color. A moving head flies over the disk surface, suspended on a cushion of air, and reads and writes the surface magnetically, while the disk spins at about 3000 rpm. The head moves in and out along a radius, and so the whole surface of the disk is covered. This magnificent device is at the heart of most computer file systems (including the one used for this newsletter). Of course, being the heart of the system, this device is subject to occasional "heart attacks", known as head crashes. Better not to know about those, but just imagine said magnetic head losing its air cushion and falling down onto a steel disk rotating at 3000rpm. Then imagine what happens to the data on said disk.

Such devices ain't cheap.

Therefore, it makes sense if it can be used to hold several users' data, which is feasible only if the data can be protected by the user from other users.

This is the other main purpose of the modern operating system. It allows users to pretend that they are the only ones on the machine. Even when their programs go sour, other users are protected against them. At the same time it arbitrates among users for resources, such as CPU time and the various peripherals.

There is a third function which is only beginning to be realized, and that is the notion of user services. You see, a bare-bones computer is really quite an ugly device to use. While machine instructions are dumb, peripherals are even dumber. To use the disk drive, no fewer than six registers have to be loaded with such things as disk track and sector address desired, memory address at which the data transfer is to start, length of transfer, function (to or from), and a whole slew of special options which can be turned off but can never be ignored. It's really much nicer if a program can just talk about a file by name, and let someone else handle the problems involved.

This turns out to be necessary, in fact. If a user were permitted to talk to the disk registers directly, he could read (or write!) anyoody's files, or (more likely) scramble the whole disk. Therefore, the operating system arbitrates here, too, and allows him to talk to a file by name. Rather than talking to the disk drive, the user talks directly to the operating system by what is known as a system call. This is a special instruction which allows the operating system to take control and service the request. It manages the disk, and takes care of looking up where on the disk this file lies, and effecting the transfer of data (if the program is allowed to do it). It then returns control to the user, providing the program with status information on how the job went (Status information can range roughly from "All OK, Jack!" to "Blow it out your shorts!".). This is only one example of a system call; most good systems have upwards of thirty such calls, each one of which provides some service to the user's program.

It should be noted here that except for system calls, it is the job of the operating system to impersonate the Invisible Man; that is, except when it is servicing a request the program and the user should be blissfully unaware of its existence. Typically there is some sort of control language, taking the place of the buttons and switches mentioned above, which a user uses to run his programs, but this is itself just anotner program, and not part of the operating system. Once you can run several programs at once, you see, there is no reason not to make some of them "system programs", which provide services to the user such as running his programs by name.

I see we're running over this month. I suppose the explanation of the column title will have to wait again. I'll get around to it, really I will! (I am open to bribery at cons...)

IT MAY OR MAY NOT COME IN THE MAIL

-THOUGHTS ON PARTS

By now any idiot ought to know it's cheaper to order parts by mail out of the backs of magazines. It might take a few weeks, but if you stagger your projects and plan ahead, you'll be bucks ahead too.

But--what if you need a 7490 in a hurry? Or (worse yet) a variable capacitor?

There are retail outlets for odd parts. Not like there used to be, but it hasn't all dried up yet. You just have to know where to look.

I've been a Chicago man all my life, and the greatest single knot of GT people lives in the Chicago area. So right now I'll just try to describe some of the retail parts places in or near Chicago. If anybody else out there knows of an outstanding retail dealership, let's hear about it.

Radio Shack is, of course, everywhere. And everything they sell is roughly the same at every store, which is to say, questionable. I have a hunch they buy factory fallout IC's, slap a Radio Shack number on them, and sell them as prime. I've gotten bad parts from RS, as have others in GT. They even sold me a digital clock PC board that was laid out wrong! The emitters and bases of the driver transistors were reversed, resulting in no readout. It drove me nuts for awhile. They do have a fair selection, but watch what you buy, and don't hesitate to haul it back if it's no good.

Olson used to have a lot more than they do today. They've swung over to HiFi and TVs. It never hurts to have one of their catalogs, since they do carry occasional unusual parts at good prices. But by and large, if you can't find it somewhere else, you won't find it at Olson.

Lafayette carries even less in their stores than does Olson. What they do carry seems relatively good quality, but also more expensive. Having once worked for Lafayette, as a repair tech for $2.50 an hour, I can tell you that the average markup on their merchandise is 350 to 400%.

Gemco is at Madison and Franklin, downtown. This is not a chain. It is, however, one of the most marvelous places to go when you need parts. Gemco is the closest thing to a continuously running hamfest I've ever encountered. Envision a store twice as big as any Radio Shack around, full of long tables crammed with little boxes full of parts at 15¢ apiece. They have an incredible assortment of all types of capacitors: silver micas, ceramic disks, electrolytic, bypass, feedthru. They have all kinds of wire, lots of transformers, and certainly any sort of tube you're ever likely to need. No ICs. They also have a lot of TV replacement parts and odd surplus that defies description. Don't hit Chicago without hitting Gemco.

Majestic is at 2522 S. Michigan Avenue, in the heart of a rotting neighborhood, and hard to get to. It's very similar to Gemco, leaning more to scrunge-scrounge and TV repair junk. It would be a nice place to browse if you could be a little surer of getting out of the neighborhood alive.

E.D.I. is on Elston north of Lawrence. This is the mainstay of north side techies when they need something in a hurry. E.D.I. is a distributor of a lot of big-name electronics, and deals in odd-lot surplus on the side. Their surplus is hamfest-quality stuff, only more expensive. Their flyer is good to have on hand, tho.

Elston Surplus is one of the flakiest places I've ever seen. It's a one-man operation in a drafty brick warehouse behind the Pepperidge Farm outlet store on Milwaukee Avenue just past Howard St. This is the classic odd-lot surplus dealer. He has tools, DC motors, pipe fittings, hardware, metal, plastic, and more transformers than I ever knew existed. Lately he has been getting such computer-type scrounge as boards, heat sinks with monster transistors, and complete used keyboards a la CRT terminals. He had a complete era 1963 computer tape drive at one time. Elston is a truly marvelous place for the tinkerer, and a very good place to make a routine stop every Saturday. He doesn't publish a catalog of any kind, and his stock changes from day to day depending on what he can buy, so you just have to bop by and see if he has what you need. He isn't open evenings, nor Sundays. Another can't-miss place when you're visiting the Windy City.

Joseph Electronics is farther out Milwaukee Avenue just past Gulliver's Pizza at Dempster. It's similar to E.D.I. save that it caters a little more to the Experimenter. It has PC and vector supplies, HEP semiconductors, miniboxes, cabinets, and lots of new, not-surplus goodies. Only one catch - prices are somewhere past the sky.

That's the picture in Chicago. How is it in the other big cities? You tell me, and we'll tell everybody else. [After all, we may have to repair the robot in some convention city or other... - MOB]

I have another late mail-order endorsement. Circuit Board Specialists, Box 969, Pueblo, Colorado, has broken my previous record for quick service by getting my order to me in five (5) days. this is a one-man place which largely makes up circuit boards for projects appearing in the big ham radio magazines. I ordered a board and some parts for a frequency counter I'm building out of QST. His stock may not be of interest to too many of you, but service like that can't go unacclaimed. ----------

A MONODE PRIMER

BY DAVE CORNER

PART 3 STATE OF THE ART

In the previous two installments of this article, we traced the monode's historical origins up to the present century, and have seen what the era 1900-1950 has done to exhonerate the device, with its capricious behaviour when taken on conventional terms. To refresh your dynamic memories, the monode's zero-current characteristic (conventional flowing current) causes unique behaviour which must be dealt with on its own grounds, exactly as is the case with the zero-resistance superconductor. By the way, superconducting monodes would be nothing special; no current flow means no worrying about resistance (conventional stationary resistance).

Metals and metal oxides are still most widely in use in monode devices, mainly because the technology is established for MOS-based fabrication, although other materials are now being developed as low-cost replacements; thus we now have a rapidly expanding selection of devices in the new SEAMOSS (Superinsulating Epoxy And Metal Or Substantial Substitute) family, based on the ion-depleted NC (No Connection) junction. Fig. 1 shows this important innovation.

Since monodes do not use conventional current, it must be bypassed. This used to be done exclusively in the power supply by bypassing it to ground through a low resistance, and placing a multimegohm resistor or hollow plastic tube in series with the output. Then, the powerless power monode became available- a three lead device which dispensed with the current altogether. With a high quality PRM operating, a complete loss of line power might not be missed by the monode portion of the instrument for days.

The powerless power monode has its own problems, though. For one, it generates powerless heat in quantity, or 'peat' as monode engineers have abbreviated it. Special peat-conducting PEATMOS (Powerless Heat Monode Organic Semiconductor) devices were developed, and expensive asbestos grease was used to mount them to Transite pads, for peat's sake.

Modern monode devices, particularly ICs, cope with the problem by incorporating bypass resistors in the case, as we shall see.

Around 1952, the infant computer field began to see possibilities in the logically ultrasimple monode, and a team at MIT developed the first monode logic gate, which they promptly deemed a flop.

There are two types of flop, J and K, both identical, which is simply to add variety to the often boring drone of texts covering basic monodics. This is sometimes known as 'monotony'.

This same group built the first monodic computer, MONIAC, which however vanished after one of the members was imprisoned during the early stirrings of the civil rights movement. His article, which would have presaged the modern Tri State TTL concept had it not been seized prior to publication, was titled 'Rules Governing Bus-Oriented Systems'. The author, a Dr. Harold Jacobson, had the misfortune to be black, hence his hasty end at the hands of the not too technically savvy conservative thugs.*

The secret behind the flop is that the output does not follow the input, which not only simplifies its truth table, but enhances noise immunity and eliminates the distinction between synchronous and ripple-through logic as well.

One of the most widely used SSI devices in use is the Nationable Nonconductor 00125, a Quad Ignorer or Independent Latch. Figs. 2 and 3 show the basic flop and the IC, respectively. The 1K resistor shown is the standard package bypass; a low power version 00L125 is available at slightly higher cost, employing a 10K resistor.

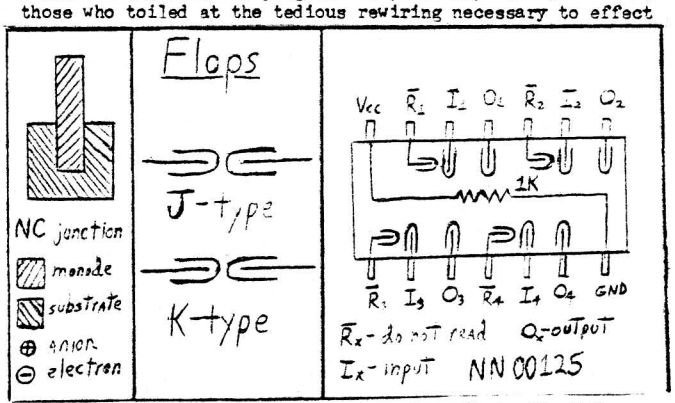
Fig. 4 shows a representative MSI device, the 00154, a 4-to-16-line bus terminator or 'driverless bus'. It is sometimes referred to as the only 'TTL monode device'; engineers know that this stands for Tijuana Transit Line in reference to the descriptive nickname.

But enough levity. Among the functions unique to monode circuitry is that served by the 0014, a No-shot Hex Schmitt Trigger- its output is a blank when it is not loaded.

Fig. 5 depicts one of the crowning achievements of modern SEAMOSS technology- the WOM or write-only memory. It is organised as a 4x4 'circular file' or 'data sink'. Note the new feature- when not active, the power is routed through a 28.5K standby resistor, giving a low .87 mW consumption of waste current.

Mr. George Ewing and associates have published plans for a room-sized, steam powered WOM, down to gasket dimensions. Those interested in a really different hobby pastime may wish to look up this article. It is probably the only MSL- huge scale integration- device in existence.

In the early days of computers, when programming often consisted of hand wiring a grid layout board for insertion into the control portion of a peripheral device, the distinction between data and program was painfully clear; however, those who toiled at the tedious rewiring necessary to effect



changes could at least console themselves that all of the brouhaha involved gave engineers the insight to use ROM-type programming in integrated circuit technology- now known as Harvard Architecture. This has been a tremendous boon , enabling them to dispense with tedious gate-by-gate design and literally write functions into standardized and extremely easy to understand ICs.

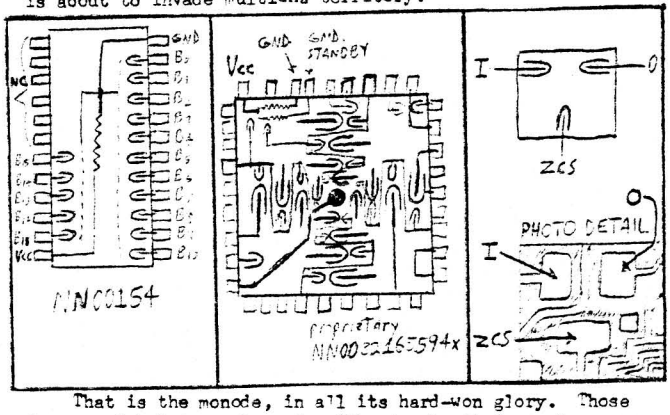
Similarly, it has been found that in monodics, one can separate program from data and then begin to drop programming functions, since in many cases monode circuits have dispensed with the inputs or outputs needed for program flow! This has thus been dubbed Dropout Architecture. It is not difficult to prove mathematically, that by employing this concept in conjunction with conventional table-folding and Programmable Logic Array methods, it will eventually be possible to design microprocessors of increasing simplicity to the point that they will vanish, making them free as well as extremely compact and versatile.

Actually, as any astute reader knows, There Ain't No Such Thing As A Free Lunch. You will at least need labels to indicate the ICs non-presence where it will not be placed. A small price, indeed.

Monodes entered the linear game in '66 with the invention of the Zero Current Source. Fig. 6 shows the important distinction between monode device inputs, outputs, and the ZCS. Bear it in mind in future reading on the subject.

The infinite impedance op amp now exists (infinite input and output), as well as a host of devices such as the suppressed leading zero-to-analog converter and its complementary trailing zero brother, plus the brand new Indefinitely Long Delay Line or 'collander brigade'. This is useful in selectively gating signal quiescent periods away from analog inputs.

For a look at something which should bear sweet fruit indeed, Nationable has just announced the first device based on a remarkable hysterisis-analogous effect in certain polymers. (They are passive with normal conductors; with monodes they are hysterical). This is the monode matching nonformer, or UHF LEAD (Lag Effect Angular Decoupler) Balun. The monois about to invade multiGHz territory!



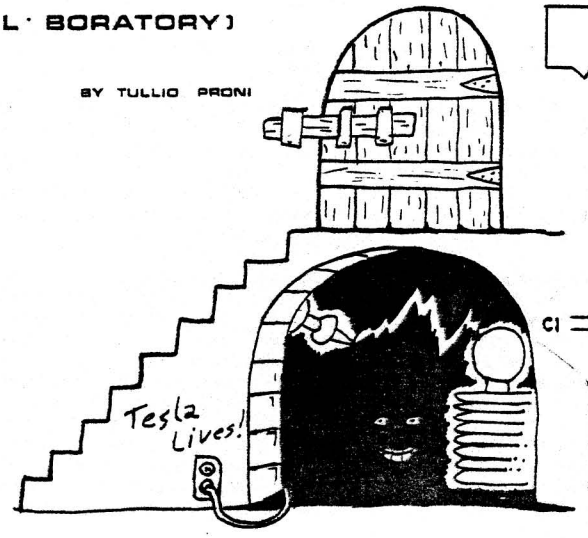
That is the monode, in all its hard-won glory. Those who were labeled cranks and softbrains by their contemporaries may rest easy in their graves now. By about this time next year, the hobbyist market should begin getting its share of the One Way; home and industry alike will convert and have no other leads before them.

* Dr. Jacobson's Gutsy Findings, Real Balls Technician, Oct. '76, pp.90-94.

NOTES FROM THE UNDERGROUND

(L·BORATORY)

BY TULLIO PRONI



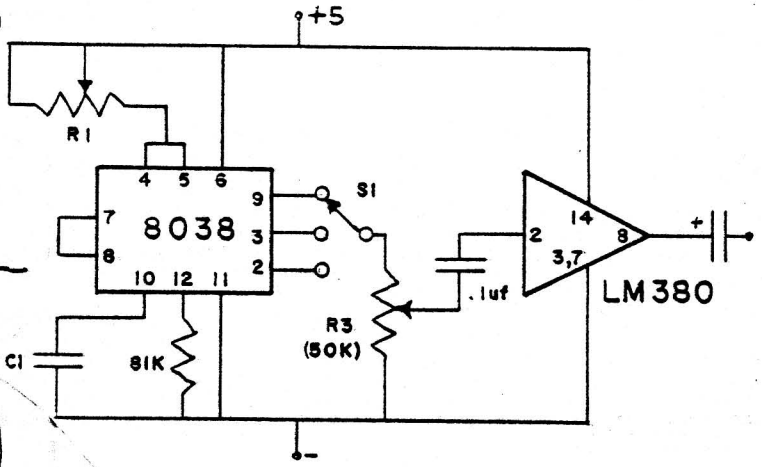


Fig. 2

Greetings, oh seekers of knowledge and enlightenment. It is time again to fortify ourselves with the knowledge of the electron and to take arms agains a sea of troubles (or tribbles) and by opposing ground them. In this case the trouble is silence. That is, you've just developed the deadliest looking disintegrator in this sector of space but you are totally helpless before a sea of turned backs. No need to fear - I will reveal how to make them turn their heads (so that you can zap them with your 5MW laser).

First, let us look at the conventional solutions. The simplest is the lowly buzzer. Buzzers are cheap, fairly loud, easy to get, and come in a variety of voltages. However, they draw a good deal of current, are relatively big, and worst of all sound like buzzers. The also generate RF noise and you can build an effective (though illegal) jammer out of one. Next there are the Sonalerts and their imitators. These are audio oscillators and transducers in one package. They produce a loud (85 db+) pure tone and operate from a variety of voltages. Their major disadvantages are their price ($6.00 +) and size (1 - 1/2" dia x 1 - 1/2"). Beyond these are a host of other devices all of which are either expensive, big, or draw a lot of current. Besides, as techies we should be able to do better ourselves.

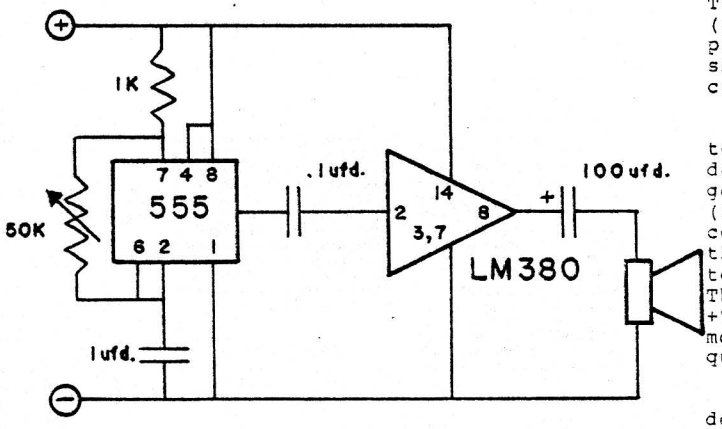


Fig. 1

The simplest do-it-yourself tone generator is just a 555 and a speaker. All you have to do is place a 100µfd cap in series with a speaker and hook them to the output of the 555 (in astable mode). Hook the other end of the speaker to + and you're in business. However, volume will not be too great; this you will probably want to add an amplifier such as the LM380. Fig. 1 shows how it's done. The LM380 is easy to work with and will give you up to 2W of power into an 8 ohm load. It requires only one external component (the cap) and will operate on any voltage from 8-22V. If you haven't played with it already you definitely should.

Now a few words about the speaker. If you want as small a speaker as possible the 1" omnidirectional from PolyPaks is your best bet. Some condenser microphones are smaller but don't work as well. If size is not important, experiment around - remember that the rating of a speaker is only its maximum power output, so there is no reason not to try 5, 10, or 20W speakers. Also, the LM380 is only one of a series of chip amps - the UA706 will give you 5W of power if you need it.

The only problem with the above circuit is that the 555 gives you a square wave output which does not sound the same as the sine wave produced by most audio generators. In order to get a sine wave we need a wave form generator such as the 8038. This is a nice chip in that it gives you sine, triangular and square wave outputs and will operate from a single-ended supply of 10-30V. This last point is important in that many VCOs (voltage controlled oscillators) require dual supplies. I suggest that you get a full set of spec sheets because there are a lot of things that you can do with this chip.

Fig. 2 shows the simplest way of producting a tone with this chip. The values of R1 and C1 determine the output frequency (100K and 1µf are good to start with), S1 selects the waveform (square, triangular, sine) and R3 is your volume control. Two 8038s can be hooked up together so that one modulates the other or a 555 can be used to pulse the output - either sounds impressive. The simplest way to strobe the 8038 is to hook its +V to the output of a 555 operating in the astable mode. This turns the 8038 on and off at a frequency determined by the 555.

Well, enough for now. Next issue I will depart from electronics and reveal a few of the secrets of working with plastics. Until then -

CIAO

GT BIODATA

JEFFREY TOLLIVER

Born August 24, 1949. Hometown: Crooksville, Ohio...somewhere to the north of Straitsville. Present residence: Columbus, Ohio.

Technically speaking (ouch!) I've been involved in electronics and physics since high school (where I had a quarter pound of black powder go off in my face...discouraging me from chemistry ever since!).

Took a course in crypto/comm repair in the Air Force but was med. discharged before I could finish. It is interesting to note just how fast equipment went state of the art. The gear I was working on in '68 (then top secret) can be bought surplus now! Sheeesh!

While my G.I. "Bennies" lasted I hit a tech school for a course in EET. By theory, it should have taken two years...in practice, it took three!

Now I'm working as a cartographer with the state of Ohio Department of Transportation. I screw up maps so people can get lost easier, foul up charts, and generally act the role of the average civil servant.

I'm still into electronics as a hobby and enjoy burning holes in my carpet with solder. As it now stands I'm circumventing Kleiner patents with a perverse pleasure (I just ordered some 2240's) and am trying to dupe Proni's blaster circuitry.

If any fellow techies wish aid in rigging circuit boards I have a screening rig and can produce from good clean positive art work...for a "slight" fee of course.

LANCE J. FERRARO

I started out this long journey Nov. 8, '51. Nothing special interested me when I was young, except for (as others in the Mob did) sticking my fingers into places they got burnt., light sockets, chemicals, fire. Plus I also took everything apart I could find. I once wondered how plastic worked so I broke a piece of it, expecting to see little mechanisms & devices inside, alas there was nothing.

Interest in science, electronics & many other fields started in 7th grade when I became the odd kid at school. So upon getting out of school each day I sequestered myself in my bedroom & tinkered & studied.

My first great interest was aviation. I was consumed by it for nearly 2 years. I learned a bit about many things during the following years, physics, psychology, sociology, chemistry, electricity, space, geology, etc. So at present I consider myself a "generalist"..."Specialist in nothing yet knowledgable of many things".

I read SF nearly exclusively, though I do not read fast I have read a respectable number of books. My CB name is "Starship Trooper" inspired by you know who.

I am in the Navy at present & look forward to the day of my discharge & I will encourage others not to join.

My studies presently are centered around astronomy (ever seen the stars from the middle of the Caribbean? Wow!) physics, psychology, photography, & cinematography. I worked in a studio for 5 years doing photography, microfilm, and cinematography, so I am most proficient in the latter 3.

I also am concerned about women's place in the world. I am pleased to see GT has female members. They are finally securing their rightful place in the world. Intelligent women are much more interesting than traditional types (The Navy is a veritable bottomless pit of sexism).

SCROUNGE

BY GEORGE SWING, WA8WTE

Send your scrounge ideas to me here at PO Box 502, Columbus, Ohio 49721.

Non-automotive automotive scrounge: Junk cars, once a real goldmine to be rifled at leisure at any county dump or landfill, have become valuable again as scrap, and are evaporating from the scene. Much can still be obtained for little, especially if you know a sympathetic junkyard man, and are flexible in your requirements.

Motors from windshield wipers, power windows, etc. as well as starters and DC generators from older vehicles, can be had for nearly scrap metal prices. They can be used for everything from antenna rotator-indicator systems to trashcan robots. Horn relays, rubber and plastic tubing, heavy gauge insulated wire, dashboard and turn-signal lamps, electroluminescent (remember them?) displays, knobs, antenna tubing, sheet metal screws, washers, nylon cable clamps, thermal flashers, ballast resistors, you name it -- all sorts of useful junque can be had cheaply from automotive scrap yards.

Don't forget large appliance scrounge: junked washing machines, for example, yield fractional horsepower AC motors, impeller pumps, pulleys, hardware, timers and relays, etc.

Wrecked building scrounge - buildings from the size of individual homes and garages to factories are demolished every so often. You can often score, even legally, large amounts of about-to-be-broken window glass for a solar collecter, electrical fixtures, etc., for scrap prices or even free.

Hamming - I would strongly urge every tech to look into the possibilities of amateur radio, both for its own sake as a pleasurable hobby and as a pleasant way to learn basic electronics. Hams these days are involved with nearly every facet of the electronics scene from digital design and software for personal microcomputing systems to satellites, TV, image processing and enhancement, all kinds of RF systrems, audio processing, etc., etc. There is also a large friendly fraternity of individuals out there with a great deal of involvement in the social side of things: public service, etc. A ham ticket requires no more study and preparation than the average high school science class, and is always available, from coaching on regs and tech stuff to loan of equipment for beginners. The references Jeff mentioned are good. Also, for a dollar or two, beaucoup back issues of the older ham magazines are available, issues printed before things got cluttered with lots of sophisticated digital systems, etc.

73 and let's hear from you out there.

The Sinister Microprocessor

If we're blessed with many more TV script writers like the guy who wrote a recent "Six Million Dollar Man," our kids are really going to have some warped ideas. (Incidentally, my family hates it when I occasionally join them to watch the program because of my running comments, such as, "How stupid!!", "They must really think we're ignorant!", and "How can you guys stand this?"

Anyway, the other night our hero Steve Austin's mission was to intercept a shipment of sinister *microprocessors*!! As Oscar (his boss) explained it, "If these microprocessors are allowed into the country, they can be used to drain all of our defense computers." Luckily, the country was saved because Austin did get the can (coconut oil can) filled with those crafty, devious little devices and prevented them from falling into the wrong hands. Foreign microprocessors being smuggled into the country in coconut oil cans ... my gosh, they must have been made on some subversive south sea island!

FROM 73 MAGAZINE

I have been a native of Kalamazoo all my life. I am an occasional cohort of Tulio and have survived the dangers of his lab many times.

That's loosely me to date. I am leaving for the Mediterranean in April so I'll be out of close contact for 6+ months. I'll miss cons. Oh, well.

NERTZ & BOLTS

LOOKS AT BOOKS

The Complete Venus Equilateral, George O. Smith; Ballantine, $1.95

It doesn't pay to be too specific in predicting the future, especially future technology. The first big breakthrough that you don't forsee will leave you looking quaint and probably silly. That's why it's usually wiser to describe what a black box does than what it's made of. "Of course the box contains bubble memories," you can say, once bubble memories are invented. "I thought you'd certainly assume it."

George O. Smith isn't content to display discreetly black boxes that do wonderful things. He builds them right onstage. And damned if they don't all remind me of gigantic 6V6's. Yes, Smith has taken 1949 and transplanted it whole into the twenty-second century.

Smith isn't much of a hardware predicter. He extrapolated the wrong way down the road, and expected that a thriving tube technology would remain a tube technology, and just get bigger, and bigger, and bigger, hence the 10-gallon tetrodes that do everything in Venus Equilateral (a radio relay station in solar orbit) but carry in your pipe and slippers.

There is nothing subtle about Smith's technology. The book is one huge clutter of sizzling arc-overs, meter needles wrapping around their pins three times (I'd love to see a meter needle actually do that for a change, instead of just reading about it), enormous banks of chattering relays, and snapping of five hundred amp circuit breakers.

If you want to see men crank open a door and walk into a power pentode, removing a hundred pound cathode with a winch, this is the place to look. If you tingle at the thought of ten-foot electron guns splattering the ether with cathode rays, search no further. If showers of sparks, gigantic capacitors, and humming thyratrons turn you on, boy, prepare yourself for a thrill.

All of the above sounds terribly snickeringly pejorative, but you know something? It isn't. Something about this book is immensely appealing. Ignore the ridiculous technological premises that froze solid almost thirty years ago, and look at the people: The best engineers in the solar system running a three-mile-long laboratory, drawing on tablecloths, patching wonders together from odd parts, nudging each other in the ribs, tinkering their little hearts out, and having such a contageously good time that it makes you ache to jump down into the page and join them.

The utter joy of playing around with technology is made more real in this book than anywhere in science fiction. Blow the silly waterheater-sized tubes out the window, this is what tinkering is all about. This is engineering at its best, as an engineer imagines what paradise must be like, from the standpoint of 1949. If Don Channing indeed were a civil engineer of the eighteenth century, he would be happily digging canals and building spinning jennies that were twice as good as anyone else's, and do it brimming over with gusto and good will. This book is about the love of creation, and 6V6's be damned, that's where I'm at. No techie should miss this one.

I've got three dozen or so 6V6's in a box under my workbench, by the way, in case you want a couple.

The first Santa Fe Hamfest 1977 is June 12!
Start planning now!

WHERE AM I?

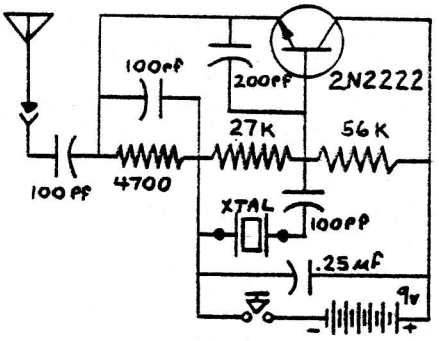
ELECTROMAGNETICALLY SPEAKING

I often envision the electromagnetic spectrum as a long horizontal line with the far left end marked DC, and the far right end off in the distant mists where the angels sing. [They sing about pair creation and detonating black holes, in fact. - MOB] In the middle are arbitrary borders dividing MF from HF, VHF from UHF, infrared from visible, etc. Down below 30 gigahertz the FCC has set up its own borders, and shakes its bureaucratic finger at those who cross them advertently or inadvertently.

If your receiver's calibration is good, you can keep to the proper side of that hairline indicating the band-edge, and be secure knowing you're on the right side of Fox Charlie[2]. But, if your receiver is like Gus's, the dial of which crumbled away generations ago, you have a problem: you don't know where you're at.

Of course, you can shout, "Hey, am I still on six meters?" into your mike. but if you aren't on six meters, you're probably on channel two, and the only answer you'll get is your upstairs neighbor tying your coax into a hangman's noose. There's a better way.

The little gadget below is a broadband crystal oscillator. That means it will oscillate on a very wide range of frequencies without any sort of tuning. You pop a crystal into the socket, and tune your receiver around the vicinity of the crystal frequency until you hear a squeal that quits when you turn the switch off. Zero beat it, and there you are, sitting on the frequency marked on the crystal.



I built mine in a phono cartridge case measuring 2" x 1.5" x 1". About 40% of the volume is taken up by a 9V battery. The entire circuit is on a little piece of PC board 1" x 3/4". It's such a simple circuit I'll insist that you design your own board. The practice will do you good. The layout isn't critical, since about the only thing that can go wrong with such a circuit is for it to oscillate, and you want it to do that anyway.

This gadget, of course, requires that you have some crystals. If you're going to be a radio techie you ought to have some crystals lying around. They go cheap at hamfests, now that novices are no longer required to use crystal-controlled transmitters. Find a guy with a cigar-box full of crystals, and offer him a couple of bucks for the box. It worked for me. It'll work for you.

Of course, if you're rich, you can order a special set of crystals ground for all the band-edges. Or, if you have a digital frequency counter, you just wasted the last five minutes you spent reading this article. Tough luck. Build it anyway. ----------JO

FNORD! FNORD!! (You can't see these) FNORD!

GIGO

FROM EWING

I must admit that Jeff has a point about the linguistic problems with metric units. Unofficial shortening has already begun. "Klick" is commonly used for Kilometer in the military, and the underground pharmaceutical industry has adopted the term "kee" for kilogram lots of medicinal smoking herbs.

I suspect that the popularization of home computing hardware will really get going with the next generation of television games, the ones currently being produced for next Christmas. Most of them will have fairly sophisticated CPU, Cassette UART thingies to feed in new "Game-of-the-month" software and all sorts of color graphics stuff for realistic TV displays. From there to home checkbook and security routines is an obvious next step. Anyway, the stuff Sarah was asking for seems to be on the way, so write your NORPOLE Santa-surrogate right away!

I still need feedback as to the kind of material needed for columns, pieces, or whatever. Geodesics and domebuilding? Bachelor survival cooking? Ham ticket Howto? Scrounge? We need feedback, either through Jeff and PT or directly.

Geodesic domes, despite some annoying limitations, are an elegant solution to the problem of roofing over large areas cheaply in terms of material. Articles on theory, construction, and living in same in non-clement (sorry, Hal) climates will be forthcoming if there is interest.

FROM TOLLIVER

--Re Ewing's Scrounge column...Don't heat miscellaneous plastics at random. One, you'll gas yourself with styrene monomer, hydrogen chloride and/or formalin. Two, most plastics soften and burn but don't melt! Three, with your luck a chunk of C4 will end up in the brew. Lotsa Luck!

("Plexiglass wouldn't melt in her mouth," said the one dragon to another. --Ed.)

FROM TODD JOHNSON

Jeff: I have come across a catalog containing some rather unique IC's of the audio, RF(!) and high speed ECL types. The prices aren't too bad but they tend to be out of stock on a lot of items. The catalog is: Circuit Specialists Co., PO Box 3047, Scottsdale Az. 85257. They have a 3-pin (!) AM receiver IC in a TO-18 can, 15 khz-3 mhz which may be of some use in Techie-Talkies.

We are having a HAMFEST here at Tech in a month or so- specifics will be forthcoming as soon as we know for sure when it will be.

(You heard the man--get that catalog.-Ed.) (!)

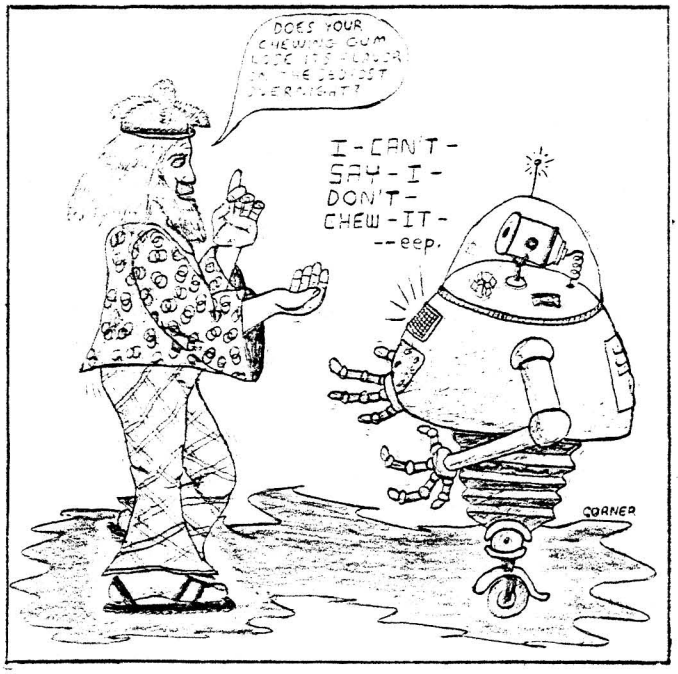
See the Bipolar Bear
limp in off the ice on His three good legs.

He rubs His static white fur against the gate,
utterly destroying it.

He squats over the drain and Pees 'N'Pees,
A common emitter, a reliable source.

He presses His fevered face against the greasy,
hot sink,
and then expires, utterly dissipated in
excess of His ratings.

-EWING



YES, I DO KNOW HOW XEROX MACHINES WORK!

...and after you read this, you will too. So nobody will ever again have to ask me, "Do you know how a Xerox machine works?" In the future I will say, "Yes, it's all in PT4! With diagrams!"

One of the allotropic forms of selenium has the property of being a very good insulator in darkness, and a reasonably good conductor in light. What we call the "drum" is an aluminum cylinder coated with about .005" of selenium and buffed to a mirror finish. This drum is the key to the whole process.

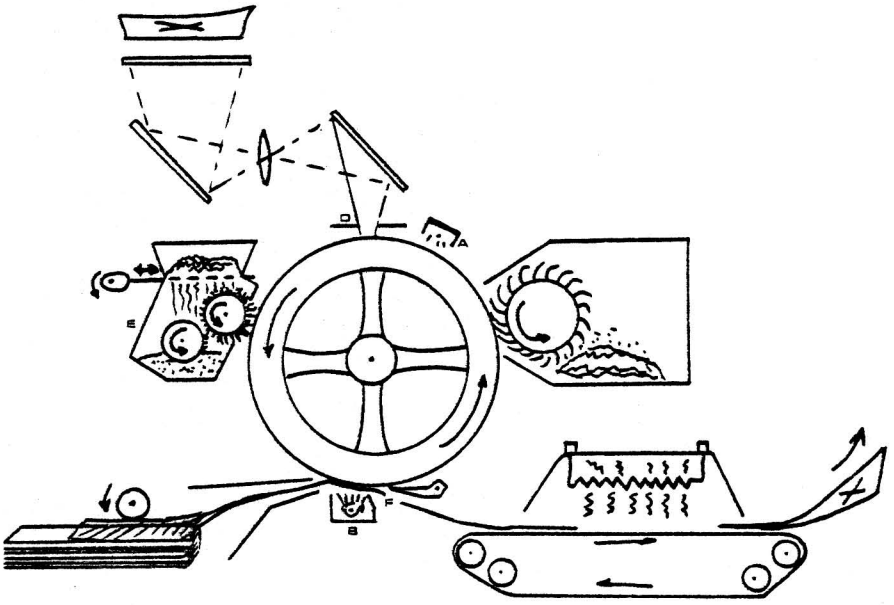
Follow along on the diagram. The devices marked A, B and C are called corotrons. They are shown in cross-section. Each is a length of aluminum channel with an insulating block at each end. Between the blocks is a thin tungsten wire.

Corotron A is the "charge corotron." A DC potential of about 3000 volts is placed on the wire in the corotron. As the drum surface passes under the charged corotron, a static charge is placed on the selenium. Since this is all done in darkness, the selenium is an insulator and carries this charge along with it.

A bright light scans across the document to be copied. This scanning motion is precisely the same speed as the motion of the drum. An image of the document is thus relayed to the drum surface by a system of lenses and mirrors. The image is passes through a narrow slot, D, which keeps light from the rest of the drum.

After the drum surface passes under the slot, it is said to be "exposed." What has happened is this: The light parts of the document, such as the unprinted paper between letters, reflects a good deal of light. This light, when it hits the charged drum, turns the selenium to a conductor and grounds the charge in that area to the aluminum. The dark parts of the document, such as the ink of letters and lines, reflects little light. The part of the drum surface falling under this part of the image receives no reflected light, and thus retains its charge.

What you have now is a copy of the document on the drum surface in varying charge levels. Dark areas of the document image exist as high charge voltage. Light areas exist as little or no charge voltage.



The image must now be "developed." Device E is called a "developer housing." In side this housing is an iron cylinder about three centimeters in diameter. Clinging to this magnetic roller is a quantity of tiny iron balls less than a hundred microns in diameter. They look like fine grey dust. When the magnetic roller picks them up, they form a brush. Sprinkle iron filings on a magnet; it's like that. This roller plus the coating of iron balls is called a "mag brush".

The mag brush is positioned so that the very ends of the brush just touch the drum surface, very lightly. A motor makes the brush rotate. The developer housing brushes the surface of the drum very gently with little strands of magnetically clinging iron dust. At the top of the housing is a little hopper with a flour sifter in the bottom. This sifter sprinkles the mag brush with "toner". Toner is a black plastic reduced to an extremely fine powder. It has the consistency of flour, or talcum.

Being extremely fine, the toner particles cling to the iron balls on the mag bristles. When the bristles brush the drum surface, the toner particles cling to charged areas of selenium, and do not cling to uncharged areas.

Dust sticks to your records by static; it sticks to the drum the same way. What you have now is an image on the drum with black plastic toner particles anywhere there was black ink on the document.

The drum surface with the developed image rotates past the developer housing. At point F a piece of paper is fed up to the drum surface. The corotron beneath the paper puts a charge on the paper, thus making the paper cling to the drum. Not only that, but the charge makes some of the toner particles on the drum stick to the paper.

A teflon finger riding on the drum surface picks the paper off the drum. The paper now has an image of the document on it, in fine black dust. This dust would rub off if you touched it. So a small conveyer belt carries the paper under a heating element, which melts the toner into the paper. The paper cools as it leaves the machine. The image is now permanently a part of the paper. There's your copy.

A regular brush of soft dacron fiber brushes away any toner remaining on the drum after the paper is picked off. Then the drum surface rotates under the charge corotron, ready to start all over again.

There's a lot going on inside that clicking beast in the corner of the office. So please don't feed it hot coffee, sandwiches, potato chips, staples, or paper clips. If you do, you'll have to call me, and I won't be there until next week.

THIS SPACE AVAILABLE

So, you've polished off another issue of Pyro-Technics. Not bad, huh? If you're sharp you may have picked up a certain editorial wiseass point-of-view permeating a goodly number of articles on these pages. Well, that's only because one particular wiseass wrote most of it himself. You can do better than that! I know you can.

There's not much to it. You don't even have to write on 5" wide paper strips anymore. (I know most of you gave up after you went to Horder's and found they didn't have 5" wide typing paper. Persistant bunch, aren't you?) You just have to type or write it so that a reasonably literate human being can read it, and send it to the address on the masthead.

Letters of comment or otherwise are heartily requested for the GIGO column. However, if you've got an interesting, meaty topic turning your mental wheels, don't waste it on a dumb LOC. Develop it a little and do an article. Then write your dumb egoboo-grabbing LOC. We'll print both. Honest.

There are only a couple of ground rules, dictated mostly by technological limitations of our reproductive systems. (Hmmmmmmm. I think I said that wrong...) Which means, don't use any blue in your diagrams. Stick to black. It comes out black in the end, so save your crayons for your Star Trek coloring book.

Make your diagrams either 5" wide or 10" wide. Nothing like half a column of blank space to make a certain wiseass editor start tearing his hair out. Draw, etch, scribble or paint them on white paper. Colored paper makes for funny lines where the pasteups show.

If at all possible, leave yourself open for wiseass editorial between-the-lines comments. We gotta get our giggles somehow. C'mon! Fill these pages! Cartoons, pictures of your girlfriend, pictures of your computer, programs, music, hell, if it's fun we'll print it.

No, not that. Show him the way to Clark St., will you?

THE MOB

Is everybody here? Is everything right? Do we have a phone number for everybody who doesn't live in a hole or on a ship? Any gripes? Births? Deaths? Engagements? Marriages? You know who to write to....

Dave Anderson
555 Clover Lane Boulder COLO 80303

Tom Andrews (614) 486-0877
2300 Brandon Rd. Columbus Ohio 43221

Mike Bentley
904 Green St. #612 Urbana IL 61801

Mike Blake (312) 486-3216
2125 West Homer St. Chicago IL

Dave Corner (312) 338-6173
1666 West Pratt Chicago IL 60626

Al Duester (906) 487-0201
231 West Coed Hall
Michigan Tech Houghton MI 49931

Carol Duntemann (312) 764-5069
Jeff Duntemann WB9MQY
6424 North Albany Avenue Chicago IL 60645

Alex Ellingsen (312) 743-6669
2091 West Estes Chicago IL 60645

Mark Evans
365 E. 15th Avenue Columbus Ohio 43201

George Ewing WA8WTE (616) 627-6587
Box 502 Cheboygan MI 49721

Gus Flassig (312) 262-0559
Kathy Echterling
6611 North Ashland Ave. Chicago IL 60626

Jim Fuerstenberg (312) 446-9120
624 Elder Lane Winnetka IL 60093

Lane J. Ferraro
USS Pensacola (LDS38) R Division
FPO New York 09501

Gordon Garb
Box 1866 Ft. Collins Colo. 80522

Bob Halloran (614) 421-1252
134 W. 9th Avenue Apt D Columbus Ohio 43201

David S. Hoornstra (313) 994-0784
366 Cloverdale Ann Arbor Michigan 48105

Alice Insley (312) 334-3216
2425 West Wilson Chicago IL 60625

Todd Johnson
231 WCH
Michigan Tech Houghton MI 49931

Clyde R. Jones (312) 244-3875
Box 1099 Waukegan IL 60085

Ben Kuehlhorn (312) 736-2877
4819 N. Keystone Chicago IL 60630

David E. Lusch (312) (312) 249-0514
1656 McKay Waukegan IL 60085

Marcy Lyn
710 W. Mill Carbondale IL 62901

Mike Mahaffey (915) 698-9678
118 Colorado
Dyess AFB Texas 79607

Marco Mendez (312) 472-9818
3744 N. Southport Chicago IL 60613

Mike O'Brien (312) 761-4989
Sarah Shaw
1642 West Morse #1S Chicago IL 60626

Chuck Ott (312) 288-5799
2439 Logan Blvd. Apt 2H Chicago IL 60647

Doug Price (608) 257-5556
442 W. Gorham Apt 1 Madison WIS 53703

Tullio Proni (616) 342-4967
1309 Wells Place Kalamazoo MI 49001

Sarah Prince
8030 Sawmill Rd. Dublin Ohio 43017

Steve Reubart (614) 297-1270
408 E. 13th Ave. Apt B Columbus Ohio 43201

Kurt Sakaeda (312) KE 9 0910
4933 N. Ridgeway Ave. Chicago IL 60625

John Singleton
5853 Houston Rd. West Lafayette Indiana 47906

Rod Smith
922 Belvoir Drive Frankfort KY 40601

John Stanley
607 9th St. E #2 Minn-apolis MINN. 55404

Frank Stodolka
Box 456 Minneapolis Minn. 55440

Jeffrey Tolliver
305A E. 19th Ave. Columbus Ohio 43201